



# Collaboration at Scale: Enhancing Impact in U.S. Working Forests

2024







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# Executive Summary



Pacific Northwest mixed conifer forest. Photo credit: TIG.

The BTG Pactual Timberland Investment Group and The Nature Conservancy established a unique collaboration on TIG’s one-million-plus acre core timberland portfolio in the United States. Through the collaboration, TNC provides conservation advisory services to TIG in three key areas: biodiversity enhancement, climate mitigation, and permanent protection, with meaningful impact targets established for each.

This report describes the structure of the collaboration and provides detail on the tools being used to deliver meaningful impact, from acquisition pre-screens, to forest management interventions, to carbon project development.

A key component of the collaboration’s impact thesis is the belief that demonstrating the delivery of conservation and social impact while maintaining or enhancing economic value creates the opportunity to expand the innovations developed in the portfolio to millions of additional timberland acres across the U.S. Through this paper and subsequent research and impact reports TIG and TNC hope to meaningfully contribute to expansion of these practices across U.S. working forests.



# About the TIG-TNC Collaboration

The collaboration between BTG Pactual Timberland Investment Group and The Nature Conservancy seeks to leverage the scale of a million-plus acre core timberland portfolio<sup>1</sup> and the specific expertise of both organizations to deliver biodiversity, climate, and other benefits at a meaningful scale alongside potential financial returns. The collaboration – a ten-year commitment between the two organizations – aims to demonstrate how sustainable forest management can address the twin crises of biodiversity loss and climate change while maintaining or potentially enhancing economic value.

## Impact Thesis

Approximately 20% of forestland in the U.S. is under corporate ownership.<sup>2</sup> This vast amount of land – 165 million acres or an area roughly the size of California and Oregon combined – can be managed to sustain or enhance ecosystem functions and biodiversity, even as commercial operations continue to provide timber and other forest products to the world. As corporate ownership of forestland grows, this potential for scale will continue to increase.

With 1.2 million acres of land under management across several regions of the U.S.,<sup>3</sup> this collaboration leverages access to timberland to seek meaningful conservation impact in the following ways:

- **Biodiversity enhancement:** Amplifying biodiversity within high conservation value areas of the portfolio
- **Climate mitigation:** Mitigating climate change through Natural Climate Solutions
- **Land protection:** Permanently protecting ecologically valuable forest habitat

A key component of the collaboration's impact thesis is the belief that demonstrating the delivery of conservation and social impact while maintaining or potentially enhancing economic value creates the opportunity to expand the innovations developed in the portfolio to millions of additional timberland acres across the U.S.



Appalachian hardwood forest, OH. Photo credit: TIG.

<sup>1</sup> Defined as resilient, high-quality timberland assets located in deep and stable markets producing consistent cash flows.

<sup>2</sup> Congressional Research Service, 2021. <https://sgp.fas.org/crs/misc/IF12001.pdf>

<sup>3</sup> Data as of December 31, 2023.

## About TIG

The BTG Pactual Timberland Investment Group (TIG) is one of the world's largest timberland investment management organizations. TIG manages assets and commitments of US\$ 6.4 billion across nearly 3 million acres. TIG is an indirect, wholly owned subsidiary of BTG Pactual (B3: BPAC11), a publicly traded investment bank headquartered in Brazil with a market capitalization of more than US\$ 25 billion. TIG resides within BTG Pactual's Asset Management Group, which offers investment strategies across major asset classes including fixed income, equities, hedge funds, timberland, private equity, infrastructure, and real estate.<sup>4</sup>

## About TNC

The Nature Conservancy (TNC) is a global conservation nonprofit that, since 1951, has worked to conserve the lands and waters on which all life depends. Grounded in local experience and deep scientific expertise, TNC leverages science, real-world solutions, and partnerships to protect land and water and support climate action. TNC has over 5,000 staff, including 1,000 scientists, working in 79 countries and territories, and across all 50 U.S. states.<sup>5</sup>

## Structure of the Collaboration

The collaboration's structure combines the strengths of both TIG and TNC to best support the two organizations' work toward delivering ambitious conservation outcomes alongside TIG's pursuit of competitive commercial benefits. As investment manager, TIG is responsible for financial management of the portfolio, timberland operations, and the real estate sales program. TNC serves as the conservation advisor for the portfolio, providing science-based expertise to help deliver positive conservation outcomes.

The collaboration's operations are overseen by a three-person Conservation Committee in charge of defining the portfolio's conservation goals, evaluating investments against the collaboration's standards, monitoring ecological performance, and providing strategic guidance to maximize the conservation impact of the portfolio. The Committee includes two representatives from TNC and one from TIG and is chaired by The Nature Conservancy.



**CHARLOTTE KAISER**, Head of Impact Finance, BTG Pactual Timberland Investment Group

Charlotte Kaiser serves as BTG's first Head of Impact Finance, where she leads efforts to source, structure and execute impact-focused transactions, as well as build and strengthen partnerships with the conservation community and other key stakeholders, lead impact-focused capital formation efforts, and support impact-focused investment initiatives across TIG's investment portfolio.



**CATHERINE BURNS**, Managing Director of Impact Management at NatureVest, TNC

Catherine Burns, Ph.D. is the Managing Director, Impact Management for The Nature Conservancy's NatureVest team, leading efforts to bring TNC's expertise in conservation science and practice to inform institutional investment partnerships focused on forestry, agriculture, renewable energy, and tourism investments that aim to deliver conservation impact alongside returns.



**GREGORY MEADE**, Cumberland Forest Senior Project Director at NatureVest, TNC

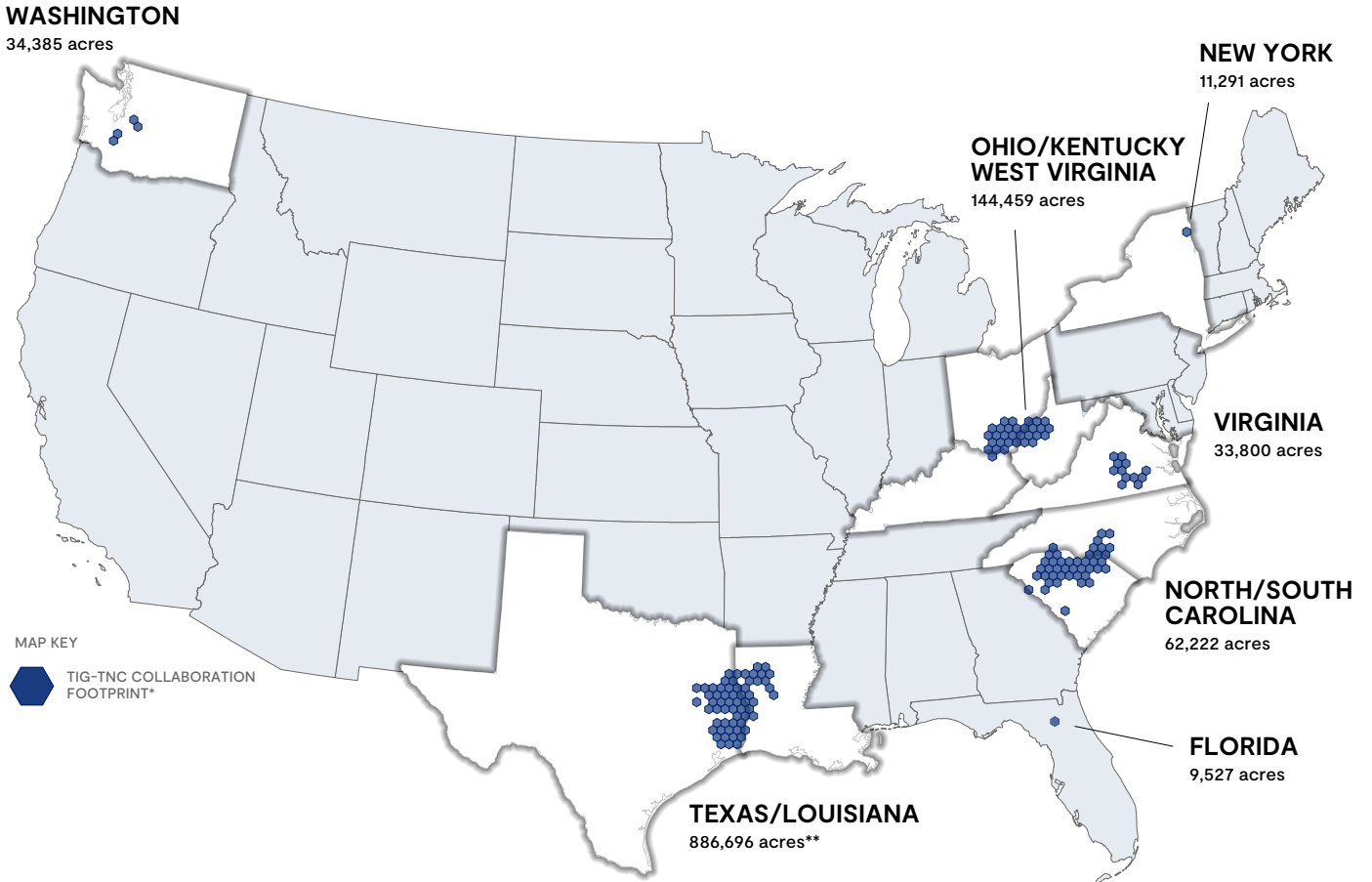
Greg Meade, the Cumberland Forest Senior Project Director, leads a first of its kind private equity investment on 253,000 acres in Central Appalachia that aims to deliver financial, conservation, and community benefits.

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<sup>4</sup> Data as of December 31, 2023.

<sup>5</sup> Data as of December 31, 2023.

# TIG-TNC Collaboration Footprint



\*Data as of December 31, 2023.

\*\*Hexagons representing TIG-TNC portfolio footprint are a generalized representation and not to scale.

\*\*\*Acreage calculated as total ownership of Caddo Sustainable Timberlands (CST) as of December 31, 2023. BTG proportional (40%) stake in CST is 354,678 acres.



# Impact Priority: Biodiversity Conservation

Biodiversity is the variety of life, including the smallest of microorganisms, plants, animals, fungi, and entire ecosystems. Well-managed industrial timberland can provide important habitat and ecosystem functions to sustain local biodiversity. To identify priority areas for conservation interventions and to select recommended forest management actions, TNC analyzed the portfolio through four indicators of biodiversity: (1) areas with previously documented significant biodiversity values, (2) areas that provide important habitat connectivity enabling species to move across landscapes, (3) presence of rare, threatened, and endangered species, and (4) the composition of tree species.

## 1. Regions of Significant Biodiversity

Regions of significant biodiversity appear across 27% of the portfolio's footprint.

This evaluation is based on a TNC dataset<sup>6</sup> compiling national and statewide assessments about the presence of exemplary natural communities and intact habitats.

### WASHINGTON

34,385 acres total  
26,678 acres of significant biodiversity  
(78% of total acres)

### NEW YORK

11,291 acres total  
9,657 acres of significant biodiversity  
(86% of total acres)

### OHIO/KENTUCKY WEST VIRGINIA

144,459 acres total  
48,904 acres of significant biodiversity  
(34% of total acres)

### VIRGINIA

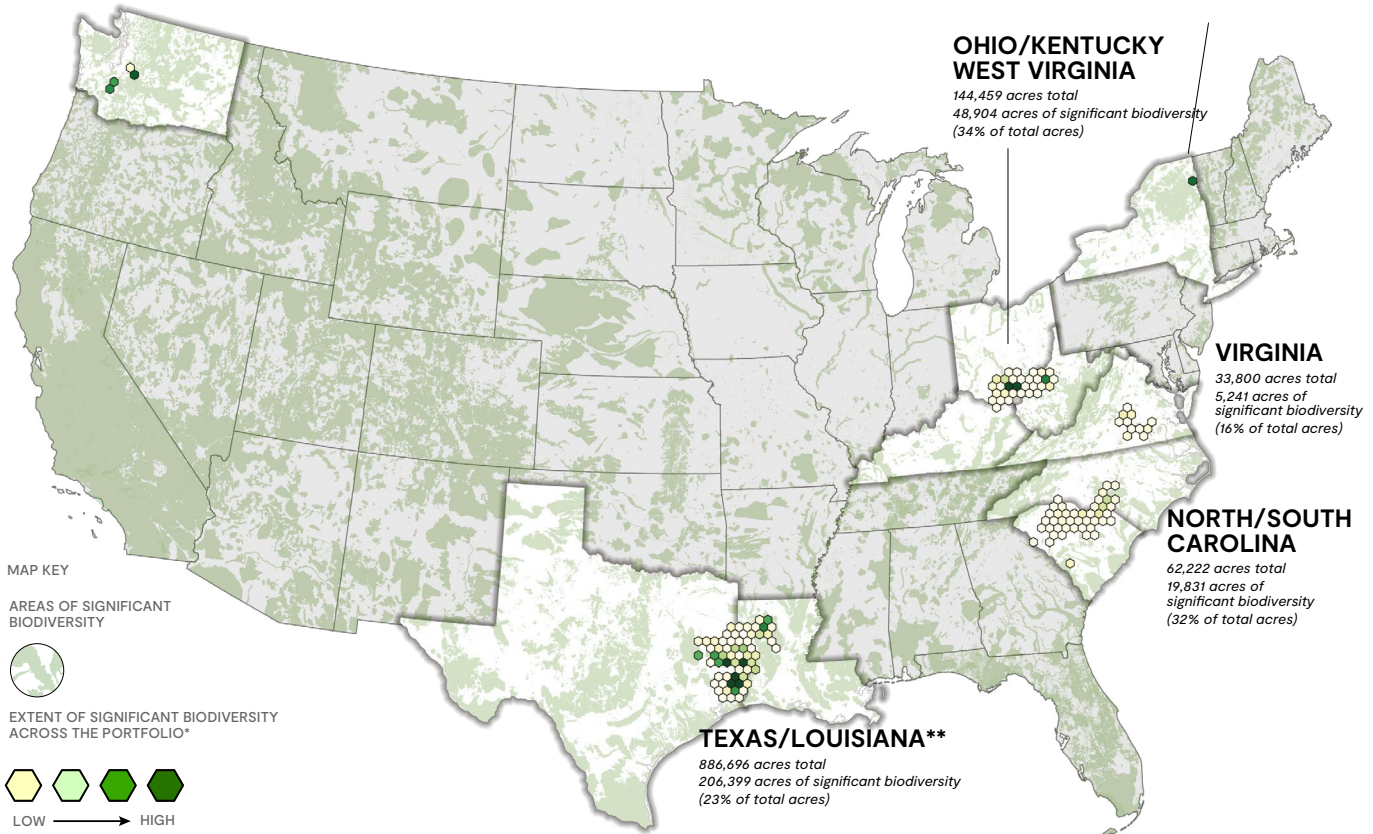
33,800 acres total  
5,241 acres of significant biodiversity  
(16% of total acres)

### NORTH/SOUTH CAROLINA

62,222 acres total  
19,831 acres of significant biodiversity  
(32% of total acres)

### TEXAS/LOUISIANA\*\*

886,696 acres total  
206,399 acres of significant biodiversity  
(23% of total acres)



<sup>6</sup> [https://www.maps.tnc.org/resilientland/coreConcepts\\_resConnSimp.html#:~:text=The%20Resilient%20and%20Connected%20Network,all%20ecoregions%20and%20geophysical%20settings.](https://www.maps.tnc.org/resilientland/coreConcepts_resConnSimp.html#:~:text=The%20Resilient%20and%20Connected%20Network,all%20ecoregions%20and%20geophysical%20settings.)

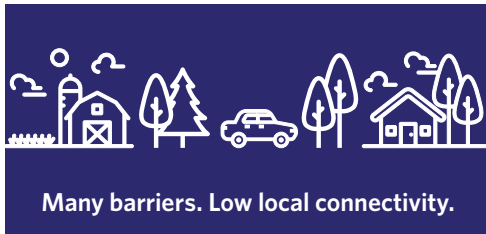
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\*\*Acreage calculated as total ownership of Caddo Sustainable Timberlands (CST) as of December 31, 2023. BTG proportional (40%) stake in CST is 354,678 acres.

## 2. Habitat Connectivity

The portfolio possesses higher levels of habitat connectivity than surrounding lands.

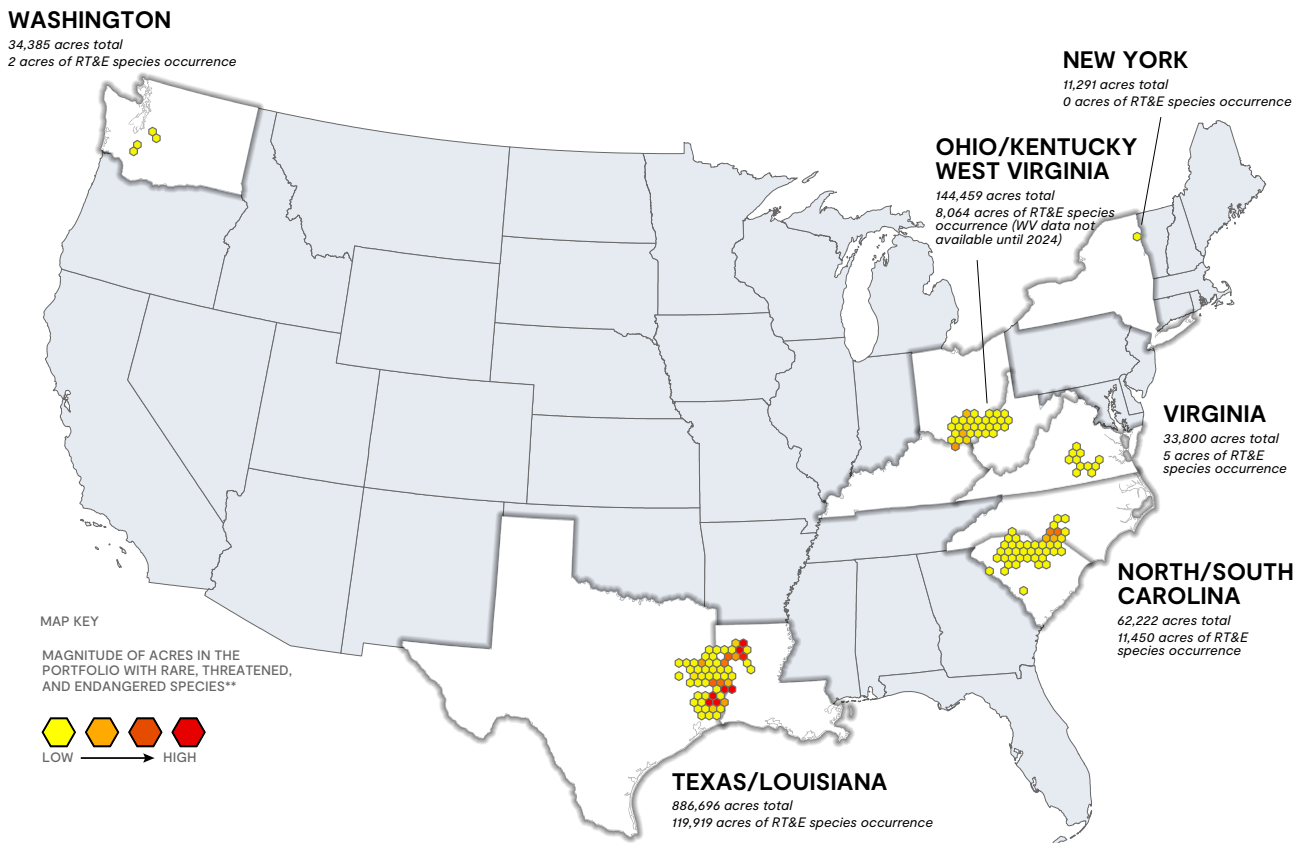
Habitat connectivity allows for species to move across the landscape for foraging, seasonal migration, or long-term relocation as they adjust to climate change. This assessment is based on a TNC dataset<sup>7</sup> of barriers to species movement designed to identify areas where connectivity can be improved (such as through decommissioning of forest roads) and where high connectivity should be preserved (such as thoughtfully planned harvests).



## 3. Presence of Rare, Threatened, and Endangered (RT&E) Species

The portfolio includes the presence of at least 140 RT&E species.<sup>8</sup>

Presence of RT&E species can be a strong indicator of biodiversity, because it implies that the habitat is sufficient to sustain species in peril.



<sup>7</sup> [https://www.maps.tnc.org/resilientland/coreConcepts\\_LC.html](https://www.maps.tnc.org/resilientland/coreConcepts_LC.html)

<sup>8</sup> The list of RT&E species found in this portfolio is based on global and state-specific designations of species status. NatureServe: [https://help.natureserve.org/biotics/content/record\\_management/Element\\_Files/Element\\_Tracking/ETRACK\\_Definitions\\_of\\_Heritage\\_Conservation\\_Status\\_Ranks.htm#:~:text=A%20rank%20of%20G1%20indicates,regardless%20of%20its%20status%20elsewhere](https://help.natureserve.org/biotics/content/record_management/Element_Files/Element_Tracking/ETRACK_Definitions_of_Heritage_Conservation_Status_Ranks.htm#:~:text=A%20rank%20of%20G1%20indicates,regardless%20of%20its%20status%20elsewhere)

\*\*Hexagons representing TIG-TNC portfolio footprint are a generalized representation and not to scale.

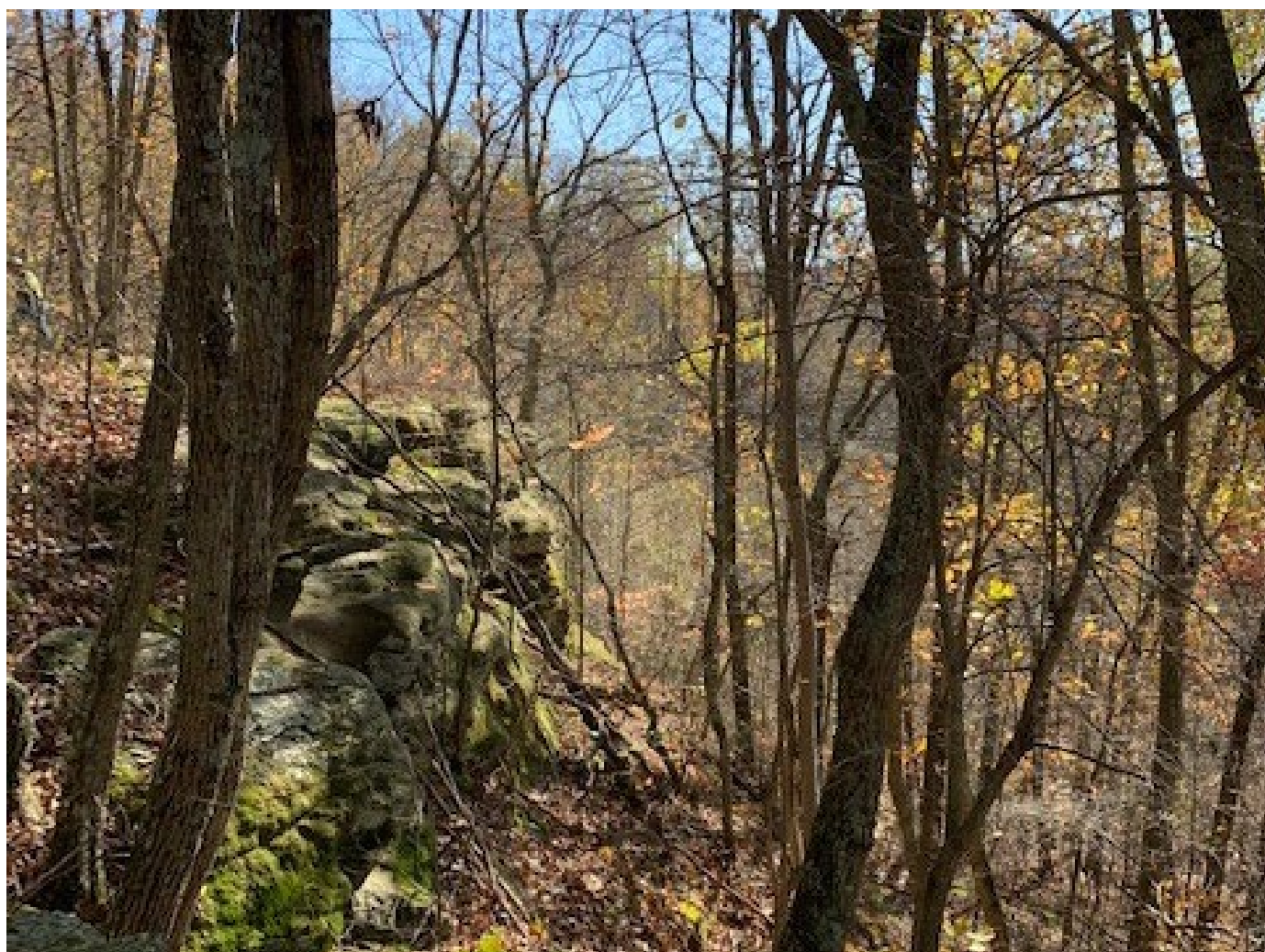
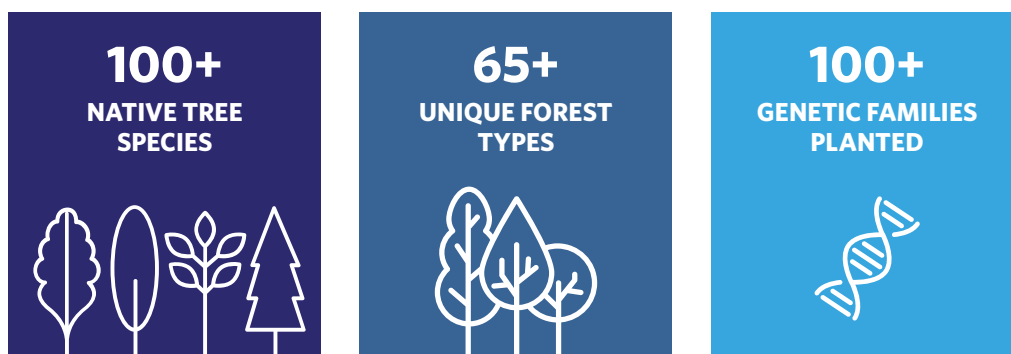
\*\*Acreage calculated as total ownership of Caddo Sustainable Timberlands (CST) as of December 31, 2023. BTG proportional (40%) stake in CST is 354,678 acres.



#### 4. Tree species composition

*There are over 100 native tree species forming at least 65 unique forest types across the portfolio.*

Diversity of tree species grown across the portfolio is important for biodiversity because, even within industrial timberland, different mixtures of tree species (often called forest cover types) provide habitat for different communities of other plants and animals. While native commercial species like loblolly pine and Douglas fir are the most abundant tree species in the portfolio, they join over 100 other native tree species forming over 65 unique forest types. Tree species diversity at the site level informs the selection of the most appropriate forest management interventions.



Appalachian hardwood forest, OH. Photo credit: TIG.

# Foundational Years of the Collaboration

Since the launch of the collaboration, TIG and TNC have focused on evaluating all aspects of the existing portfolio to inform future strategic decisions, setting portfolio-wide targets for impact, and building rigorous impact management systems and tools that will allow the collaboration to identify, implement, and assess on-the-ground impact.

## Evaluate the Existing Portfolio

At the launch of this collaboration, TNC, as the Conservation Advisor, worked with TIG to perform a detailed review of the timberland assets in the portfolio to verify compliance with a set of standards intended to avoid negative environmental or social impacts by meeting or exceeding current industry best management practices. The team also assessed opportunities for protection of native habitat and management of the portfolio to maximize biodiversity and climate benefits.

## Set Conservation Goals for the Duration of the Collaboration (through 2031)

TIG and TNC together set the following preliminary targets based on an assessment of the existing and potential future portfolio:

- 30,000 acres of forest permanently protected
- 42,000 acres of forest actively managed to enhance biodiversity
- 130 miles of streams with enhanced water quality and aquatic biodiversity
- At least 500,000 tCO<sub>2</sub>e of additional carbon sequestered<sup>9</sup>

As the teams learn from implementation of the conservation strategies, these goals will evolve as the work shifts towards the most achievable and scalable targets.

## Build Impact Management Systems and Tools

The collaboration's impact management system incorporates science-based tools, such as a biodiversity assessment and an impact rating applied to all existing and prospective assets. (See the Impact Management section below for more detail). The team will continue iterating on these methodologies to verify that the collaboration is achieving its goals and evolving with best practices emerging in both the forestry and impact investing industries. This may include raising our minimum standards as forestry best management practices change and refining our monitoring and reporting systems as new standards emerge.

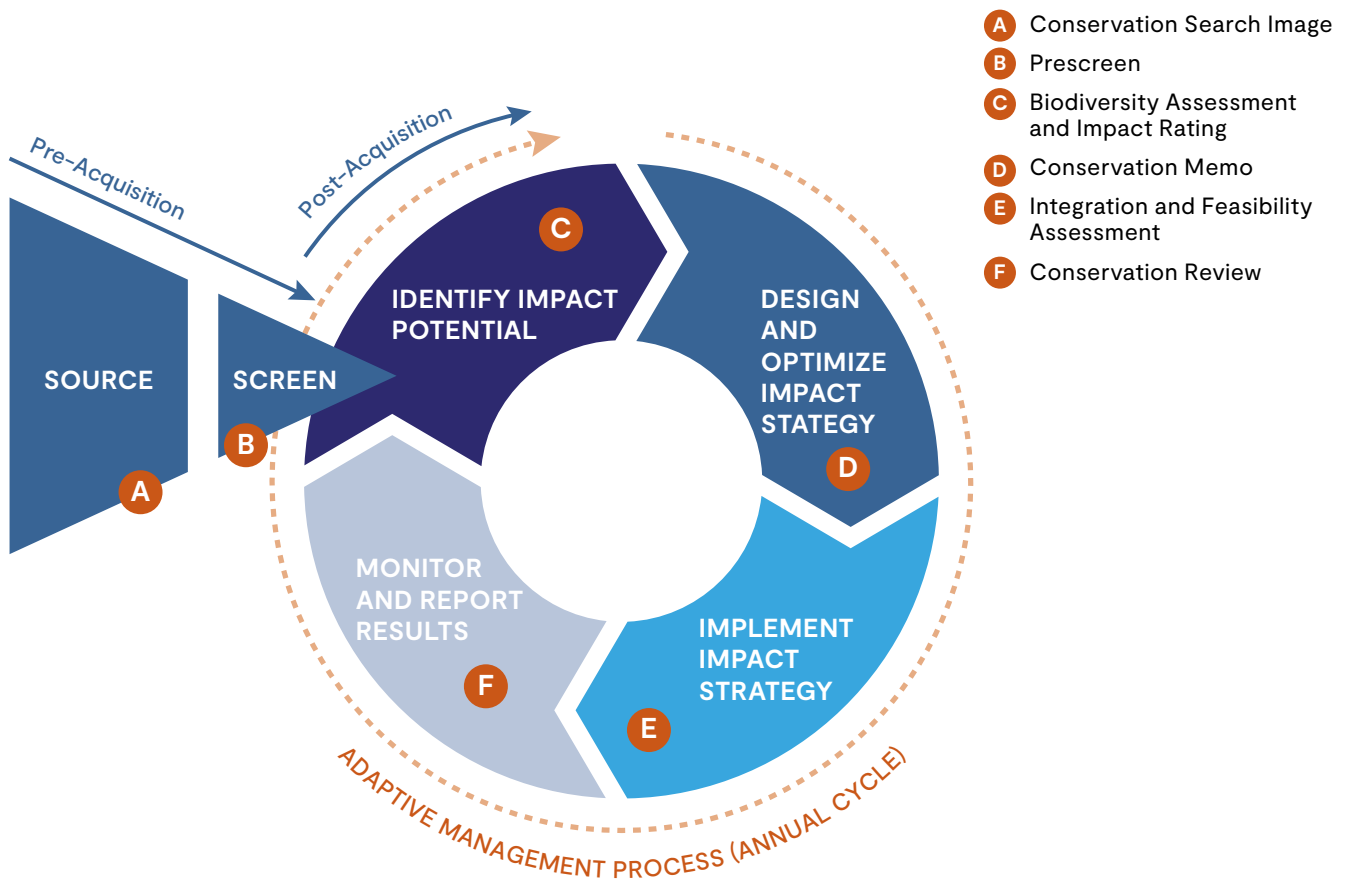
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<sup>9</sup> This figure includes projections of sequestration potential from two possible carbon projects calculated by a third-party project developer. Additionally, this figure includes 90,000 tCO<sub>2</sub>e of sequestration potential from the implementation of improved forest management practices between 2024 and 2031. Carbon volumes associated with improved forest management practices were estimated by multiplying mean above and belowground live and standing dead carbon volumes (derived from forest inventory data analyzed using the Fire and Fuels Extension of the Forest Vegetation Simulator) by projected land area on which these practices will be implemented. Mean per-acre carbon volumes were further adjusted to reflect recommended overstory retention levels within these areas. These estimates do not include future growth of retained trees or deductions for leakage or permanence. These estimated emissions reductions have not been third-party verified and thus are not eligible for sale as credits or for use to offset internal emissions.



# Impact Management Process

The impact management process considers impact at every stage of the investment and asset management processes and is supported by a suite of in-house impact tools, designed to optimize the portfolio's benefits and to avoid harm to the environment or communities.



## Source and Screen New Acquisitions

TNC informs TIG's pipeline development using the **A Conservation Search Image**, a tailored GIS-based tool that analyzes the conservation value of regions across the U.S. Once a potential acquisition has been identified, TNC **B Pre-Screens** the property for compliance with the Minimum Acceptable Standards and makes a preliminary assessment of opportunities for conservation impact.

## Identify Impact Potential

When an asset is acquired, TNC assesses the asset for its biodiversity value using forest science, GIS, and economics analysis to establish an **C Impact Rating**. The rating helps to define and prioritize future conservation strategies.

## Design and Optimize Impact Strategy

TIG and TNC use the impact rating to jointly design property-specific plans for forest management interventions and permanent protection of native habitat. TNC also conducts a carbon stock assessment to identify areas that may be suitable for high-quality carbon sequestration projects. The **D Conservation Memo** for each property details these plans, as well as a set of conservation goals against which the collaboration tracks progress.

## Implement Impact Strategy

TIG and TNC work to **E integrate the forest management interventions**—which are designed around planned timber harvests and other silvicultural activities—into each asset's annual forest management plans. The teams also pursue conservation transactions, continuously refining the protection targets based on the outcomes of each potential transaction.

## Monitor and Report Results

Annually, the Conservation Committee conducts a **F conservation review** of the entire portfolio to ensure continued compliance of timberland assets in the portfolio with the Minimum Acceptable Standards, to verify completion of pre-established forest management and protection targets, and to adjust the conservation strategy or propose new conservation goals for each asset.

Starting in 2024, the team is using GIS data to analyze forest management information and monitor the progress of each investment on a quarterly basis. This desk-based approach will be complemented by site visits and frequent collaboration with on-the-ground foresters. The monitoring and reporting strategy is expected to verify and transparently disclose the biodiversity outcomes of the collaboration.

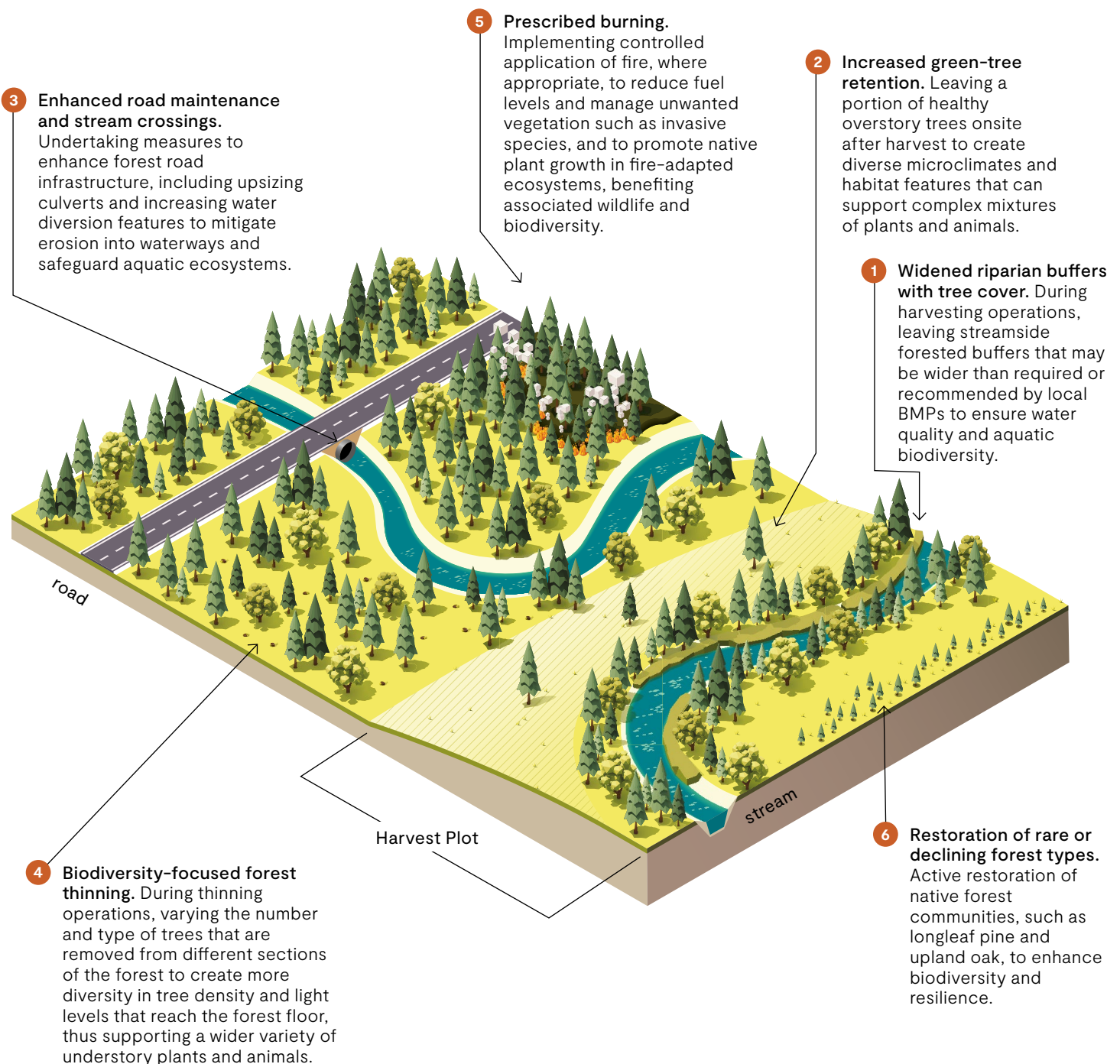


Longleaf pine seedling, Caddo Sustainable Timberlands, TX. Photo credit: TIG.



# Enhanced Sustainable Forest Management

In 2023, TIG and TNC developed a set of priority forest management practices that are intended to be integrated into forest operations and harvest plans to enhance the biodiversity of important ecological areas across the portfolio. The practices are designed to sustain and enhance locally specific biodiversity. Integration of conservation recommendations into forest management plans began in 2024 and will target nearly 5,600 acres of biodiversity-focused forest management in the first year of implementation. The Annex provides a more detailed description of each of the forest management interventions.



# Climate Mitigation

Although the land sector accounts for only 13-21%<sup>10</sup> of human-caused greenhouse gas emissions, Natural Climate Solutions (NCS) – actions to protect, better manage, and restore nature to increase carbon storage and avoid greenhouse gas emissions from natural and working lands – could deliver more than 30% of the cost-effective mitigation strategies to reach 2030 decarbonization targets.<sup>11</sup> Forests can be managed to sequester additional carbon through longer harvest rotations and other practices, thereby delivering carbon offset credits.

TNC and TIG are working together to create high-quality carbon projects in areas of strong potential for both increased carbon sequestration and biodiversity co-benefits, which includes enhancing habitat and ecological value. TNC has used field-collected data and forest growth models to identify such locations across the portfolio.

## High-Quality Carbon Projects

The voluntary carbon market depends on buyer trust in the integrity of the carbon credits they buy. The collaboration is committed to developing carbon projects that meet TIG and TNC's standards for quality, ensuring that the projects deliver the targeted climate and conservation benefits without creating negative social or environmental externalities. The five major considerations when designing a high-quality carbon project are outlined on the next page. The collaboration also seeks to use trusted registries, protocols, methodologies, and third-party verifiers to validate alignment with these considerations.



Pacific Northwest mixed conifer forest, WA. Photo credit: TIG.

<sup>10</sup> IPCC, 2021. [https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC\\_AR6\\_WGIII\\_Chapter\\_07.pdf](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter_07.pdf)

<sup>11</sup> Griscom et al., 2017. <https://www.pnas.org/doi/full/10.1073/pnas.1710465114>





## ASPECTS OF HIGH-QUALITY CARBON PROJECTS

### PERMANENT IMPACT

The impacts of a high-quality carbon project must demonstrate permanence, defined as lasting at least 100 years. A high-quality carbon project includes safeguards to prevent reversal of the project's impacts, most critically including a mechanism to compensate for any reversals.

### SOCIAL SAFEGUARDS

High-quality carbon projects ensure that they do no harm to rightsholders and interested parties and strive to generate net positive social impacts. Furthermore, projects that have a higher risk profile and/or impact specific populations must ensure net positive impact to rightsholders and interested parties as determined by them.

### MINIMAL LEAKAGE

Leakage occurs when reduced timber harvesting due to a carbon project causes the extraction of timber to shift elsewhere, potentially canceling the net benefits of the carbon project. High-quality carbon projects accurately account for leakage effects and may include solutions to directly mitigate the risk and magnitude of leakage.

### CLEAR ADDITIONALITY

Carbon sequestration and storage resulting from a carbon project is considered "additional" if it would not have occurred without carbon finance supporting the project. A high-quality carbon project should provide a solution that would not have occurred without the intervention. Assessment of additionality occurs in parallel to establishing a valid baseline and setting a project start date.

### VALID BASELINES

The baseline is the alternative scenario that could have occurred if a carbon project was not implemented. In a high-quality carbon project, valid baselines are defined as the most likely alternative scenarios predicted in good faith with support by scientific and other relevant and credible evidence and with consideration of the type, magnitude, and timing of land use changes. Carbon sequestration and storage is calculated against the baseline, which therefore influences the number of credits generated.

# Land Protection

Permanent protection aims to legally safeguard ecologically significant land in perpetuity. Permanent protection mechanisms also often include measures to enhance habitat and landscape resilience, and – in some cases – expand public access to recreational opportunities. The collaboration is pursuing permanent protection via two mechanisms:

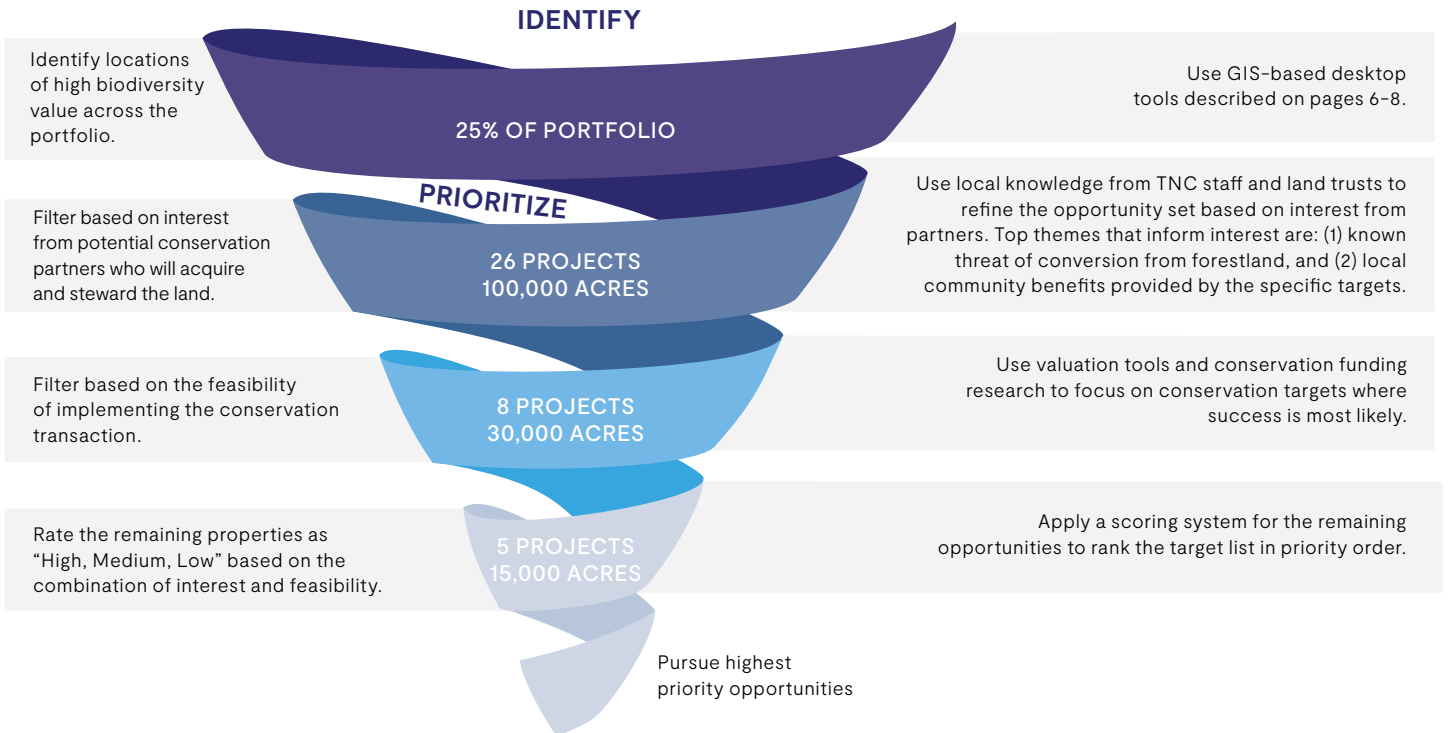
- **Fee Sales:** A direct sale of land to a public agency or land trust to create a nature preserve or public recreation area.
- **Working Forest Conservation Easements:** A legal agreement that permanently limits the use of the land to working forest, sometimes with operating restrictions that protect the conservation values on the property while allowing for compatible forest management activities.

## Protection within a commercial landscape

Developing and delivering permanent protection outcomes on working forest lands within a commercial investment platform presents unique challenges. The collaboration seeks to experiment with pathways to identify, prioritize, and implement permanent protection opportunities within this context.

### OBJECTIVE

### METHOD





# Looking Ahead

Looking ahead, the collaboration will seek to incorporate the learnings from the previous years of implementation to refine and improve our conservation strategies and impact delivery. This includes learning from the implementation of site-specific forest management strategies, as well as the pursuit of portfolio-wide goals for protection and carbon sequestration.

Additionally, the collaboration will continue to deepen and refine its approaches to monitoring conservation activities across the portfolio and their ecological and social impacts. As part of this, we will evaluate the technical tools and participatory monitoring methods that the collaboration believes are most suitable for this portfolio. Effective monitoring and evaluation are essential pillars of our commitment to transparency, accountability, and continuous improvement. The collaboration will also continue to expand the scope of impact delivered across the portfolio. In 2024, while continuing to deliver biodiversity and climate outcomes, we aim to develop and launch social impact action plans for each purchase unit and a research program focused on innovation in managing working lands for biodiversity.

Looking to the future, TIG and TNC are excited about the opportunities ahead and encouraged by the shared dedication of both institutions to the goals of this collaboration. With a focus on innovation and practical action, the teams are committed to making tangible progress that benefits forests, biodiversity, and communities.

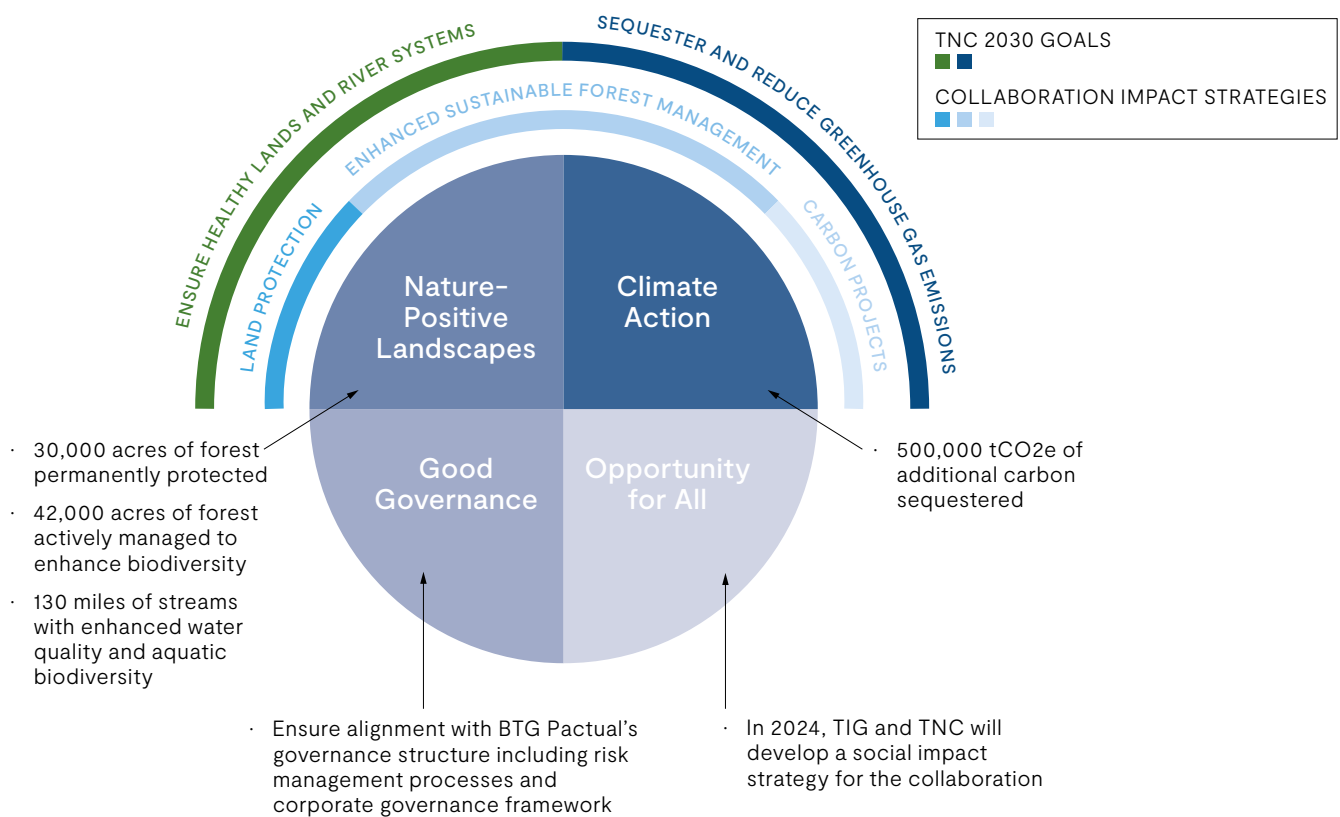


Silky Camellia, Caddo Sustainable Timberlands, TX. Photo credit: TIG.

# TIG Impact Pillars and TNC Global 2030 Goals

TIG aims to maintain a rigorous impact approach grounded in a materiality assessment conducted in 2023. TIG’s company-wide impact strategy focuses on delivering outcomes against four pillars that align with its mission: nature-positive landscapes, climate action, opportunity for all, and good governance. In addition, TIG’s impact approach and subsequent reporting is aligned to globally recognized frameworks including the Sustainability Accounting Standards Board (SASB) and the Global Impact Investment Network’s (GIIN) IRIS+ System.

The Nature Conservancy has aligned its work around contribution to the global goals for the organization that it aims to achieve by 2030. This collaboration contributes to two TNC goals: sequestering and reducing greenhouse gas emissions, and ensuring healthy lands and river systems.



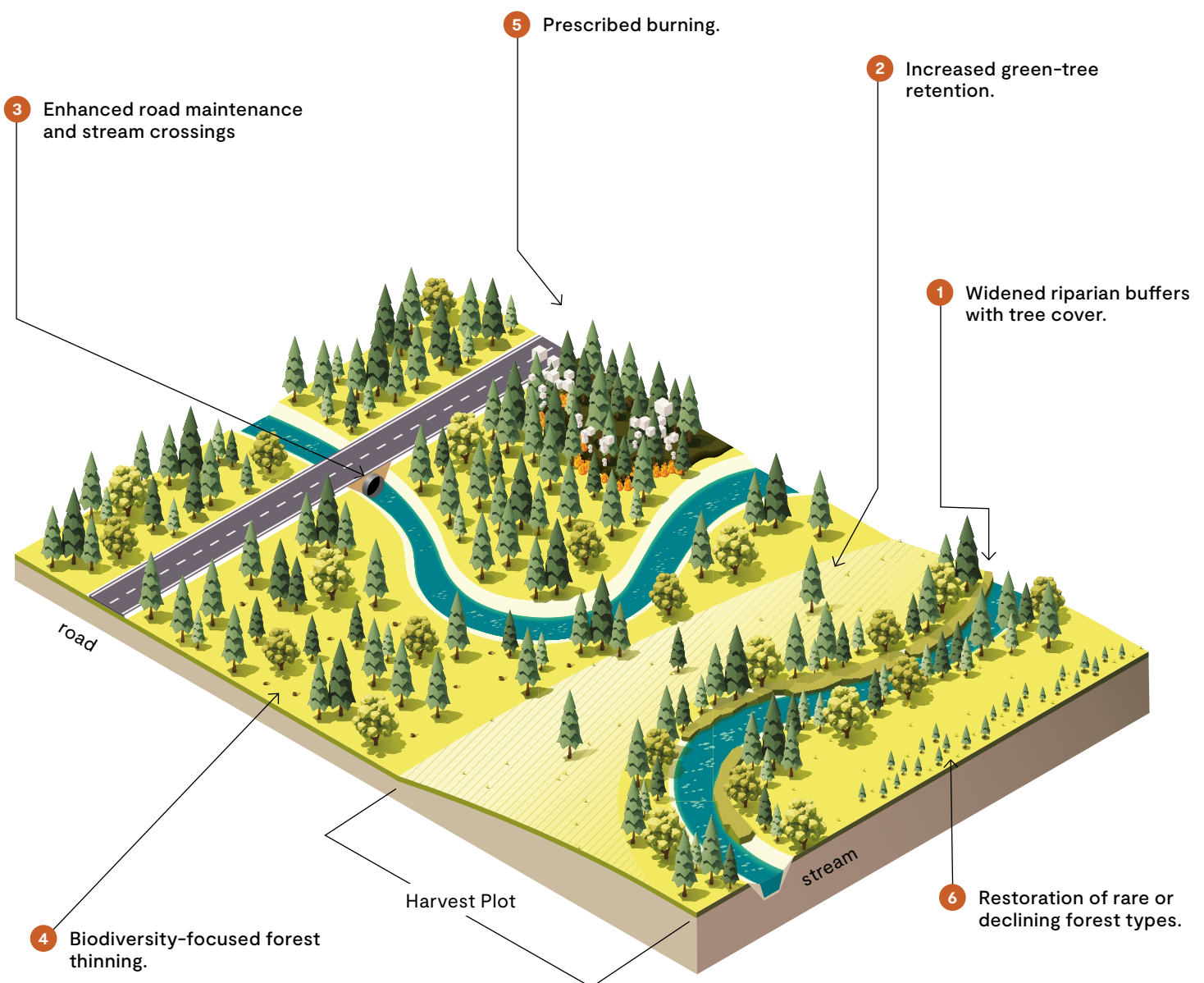


# Notice to Recipients

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# Annex: Descriptions of Forest Management Interventions

In 2023, TIG and TNC developed a set of priority forest management practices that are intended to be integrated into forest operations and harvest plans to enhance the biodiversity of important ecological areas across the portfolio. The practices are designed to sustain and enhance locally specific biodiversity. Integration of conservation recommendations into forest management plans began in 2024 and will target nearly 5,600 acres of biodiversity-focused forest management in the first year of implementation.





## 1. WIDENED RIPARIAN BUFFERS WITH TREE COVER

<b>What is it?</b>	Riparian buffers are strips of vegetation along water features such as streams. Most U.S. states require that forest harvesting operations leave a riparian buffer. However, specific requirements such as buffer width, stream types requiring a buffer, and the amount of tree cover vary from state to state. This action aims to go beyond what is required or recommended in some states to maintain wider forested buffers during harvesting operations and to leave trees standing within all buffers.
<b>Why is it important?</b>	Riparian buffers filter sediment in runoff before it enters waterways, and the additional tree cover within these buffers provides shade to prevent overheating of the stream. Collectively, these aspects significantly enhance water quality, with benefits for freshwater species and for downstream communities. Forested riparian buffers also sequester carbon and provide habitat and movement corridors for many wildlife species.
<b>How is it implemented?</b>	Many of the portfolio's 2024 harvest plans in the Pacific Northwest and Appalachian regions have been designed to widen riparian buffering relative to what is required by state Best Management Practices (BMPs), generally by 30–50 feet, and to ensure that these widened buffers are at least 50% forested, as opposed to consisting of shrublike vegetation. Implementing these changes to the 2024 harvest plans is expected to improve water quality along 11 miles of streams in high-biodiversity areas in these regions, accounting for 100% of the mapped streams within the harvest zones.

## 2. INCREASED GREEN-TREE RETENTION

<b>What is it?</b>	Green-tree retention is the practice of leaving a portion of healthy overstory trees to grow onsite after mature forest stands are harvested.
<b>Why is it important?</b>	The shade, shelter, and structure created through green-tree retention can enhance biodiversity within harvested areas by creating diverse microclimates and habitat features on a harvested site to support complex mixtures of plants and animals.
<b>How is it implemented?</b>	We have designed 2024 harvest plans in the Pacific Northwest and Appalachian regions to include additional green-tree retention beyond what is required by state BMPs. Depending on the location, timber harvests may retain 1–12% of the overstory. Areas that have been prioritized are those that contain high biodiversity, are seasonally wet, or immediately surrounded by forest landscape dominated by young trees.

## 3. ENHANCED ROAD MAINTENANCE AND STREAM CROSSINGS

<b>What is it?</b>	Forest road infrastructure requires frequent maintenance such as grading, installing and maintaining water diversion features, and cleaning and replacing culverts (pipes under roads that channel flow from a stream). Upsizing culverts or replacing culverts with bridges and ford crossings is especially beneficial for withstanding high flood events.
<b>Why is it important?</b>	Poorly maintained forest roads can lead to substantial pollution to waterways through erosion and negatively impact the biodiversity of aquatic ecosystems. For example, stream crossing culverts that are too small for the volume of water running through them during storm events can fail and allow sediment to enter waterways. Such road infrastructure failures are expected to become more frequent in the future due to extreme weather events, higher peak flows, and shifts in precipitation associated with climate change. Culverts that are too small also can restrict movement of freshwater species up and down the stream, which is important for their ability to respond to changing conditions.
<b>How is it implemented?</b>	In 2024, we will be exploring opportunities to upsize culverts during standard replacements or remove unnecessary culverts and increase the frequency of water diversion features on forest roads used during harvest operations. Additionally, an ambitious culvert inventory and assessment program has been launched on the 5,000+ miles of forest roads on the portfolio's largest asset located in Texas and Louisiana.

#### 4. BIODIVERSITY-FOCUSED FOREST THINNING

<b>What is it?</b>	Thinning is a forestry practice whereby some trees are harvested from a forest stand to provide the remaining trees with extra room and resources to grow faster and bigger. For most commercial tree species there are standard thinning prescriptions that are applied consistently to each section of the forest. Biodiversity-focused forest thinning varies the number and types of trees that are removed from different sections of the forest relative to standard thinning prescriptions to create more diversity in tree density across the landscape.
<b>Why is it important?</b>	Biodiversity-focused forest thinning aims to increase the range of light levels reaching the forest floor. As a result, the forest floor can host a wider variety of understory plants and animals, enhancing the overall biodiversity the forest can support relative to standardized thinning operations.
<b>How is it implemented?</b>	The portfolio's 2024 harvest plans in North and South Carolina include recommendations for biodiversity-focused forest thinning on 950 acres with recognized biodiversity.

#### 5. PRESCRIBED BURNING

<b>What is it?</b>	Prescribed burning is the controlled application of fire, where appropriate, to reduce fuel levels and manage unwanted vegetation such as invasive species, and to promote native plant growth in fire-adapted ecosystems, benefiting associated wildlife and biodiversity.
<b>Why is it important?</b>	Low-severity fire was historically a frequent and natural disturbance that occurred in many forest types, such as upland pine forests of the Southern U.S. and upland mixed hardwood forests of the Appalachians. Effective fire suppression programs have greatly reduced the occurrence of forest fires in these regions, saving property and life, but have also led to a loss of biodiversity among these fire-adapted ecosystems. When applied in fire-adapted ecosystems, prescribed understory burning can again promote the growth of native, fire-tolerant plant species and create open forest structures that provide desirable habitat for associated wildlife.
<b>How is it implemented?</b>	In 2024, we are seeking to implement prescribed burning on 4,500 acres on assets in East Texas and Louisiana. If implemented, this burning will be focused on areas where invasive plant species like Yaupon holly are displacing native vegetation, as well as several areas of high biodiversity value.

#### 6. RESTORATION OF RARE OR DECLINING FOREST TYPES

<b>What is it?</b>	Active restoration of native forest communities, such as longleaf pine and upland oak, through practices like planting or carefully planned natural regeneration.
<b>Why is it important?</b>	Native species associated with the local ecosystems, such as longleaf pine on sandy soils in the U.S. South and upland oaks on drier slopes in the Appalachians, are commercially valuable, important for biodiversity, and are expected to be highly resilient to long-term climate change.
<b>How is it implemented?</b>	In 2024, we are seeking to restore 300 acres of longleaf pine in the U.S. South and nearly 100 acres of upland oak in the Appalachians. These areas were identified for action in 2024 because they represent some of the best opportunities in the portfolio to better support rare or declining forest types.



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